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E76-10090

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(E76-10090) RETRANSMISSION OF HYDROMETRIC
DATA IN CANADA Progress Report, 1 Apr. - 30
Sep. 1975 (Department of the Environment,
Ottawa) 12 p HC \$3.50 CSCL 14B

N76-16513

G3/43 Unclass 00090

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SR 28190

Retransmission of Hydrometric

Data in Canada

R.A. Halliday

Applied Hydrology Division
Department of the Environment
Ottawa, Ontario, Canada
K1A 0E7

October 1975

Type I Report for the period April - September, 1975

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1. SR No. 28190	2. Type of Report Type 1	3. Recipient's Catalog No.
4. Title Retransmission of Hydrometric Data in Canada		5. Report Date October 1975
		6. Period Covered April 1 - September 30, 1975
7. Principal Investigator R.A. Halliday		8. No. of Pages 9
9. Name and Address of Principal Investigators Organization Applied Hydrology Division Department of the Environment Ottawa, Ontario K1A 0E7		10. Principal Investigator Rept. No.
		11. GSFC Technical Monitor Frederick Gordon
12. Sponsoring Agency Name and Address As above		13. Key Words (Selected by Principal Investigator) Landsat, GOES. Data Retransmission
14. Supplementary Notes Report prepared by I.A. Reid and R.A. Halliday		
15. Abstract Thirteen Data Collection Platforms, nine GE and four Ball Brothers Research Corporation (BBRC) Convertible Data Collection Platforms model CDCP-100 (CDCP), are transmitting hydrometric and meteorological data from remote hydrometric stations within Canada's mainland to Landsat 2. The system has met requirements and the suitability of retransmission by satellite has been demonstrated. Several CDCPs have been checked out at a site on the Bow River below Carseland Dam near Calgary, Alberta. Experiments using one BBRC CDCP are being made in the GOES mode. So far these experiments have been unsuccessful.		

TYPE I PROGRESS REPORT FOR PERIOD

APRIL 1 TO SEPTEMBER 30, 1975

1. Accomplishments

The program continued with accomplishments during the reporting period as follows:

Four Ball Brothers Research Corporation (BBRC) Convertible Data Collection Platforms Model CDCP-100 were installed in the Landsat mode. One BBRC CDCP-100 was converted to the GOES mode for transmission to SMS-1 located over the equator at 75° west longitude. Unfortunately the National Environmental Satellite Service (NESS) did not receive transmissions. Checks are now being made to find out the cause of the trouble so that remedial measures can be taken.

Below are listed the DCPs installed during the report period. All units are transmitting water level data.

DCP	Date Installed 1975	Station	Lat.	Long.
6126	March 25	Carney Creek below Pambrun Creek	50° 10'	116° 35'
6502	Aug 7	Churchill River at Muskrat Falls	53° 15'	60° 47'
6404	Aug 13	St. Francis River at Outlet of Glasier Lake	47° 12'	68° 57'
6512	July 15	Root River near the mouth	62° 29'	123° 26'
6572	July 15	South Nahanni River above Virginia Falls	61° 38'	125° 48'

Platform 6126 on Carney Creek was removed from the Duncan River below B.B. Creek Station on November 20, 1974 as land line telemetry was extended to the site by the British Columbia Hydro-Electric Power Authority. The DCP at its new location will be used mainly for providing water level data for flood forecasting on the Fraser River. DCP battery voltage data are also transmitted.

Platform 6502 on the Churchill River is used to monitor the inflow to the Churchill Falls Hydro Electric Power Project. The plant has a generating capacity of 5×10^6 kW and supplies power to the eastern part of the continent.

Platform 6504 is located on the St. Francis River, a tributary to the St. John River in New Brunswick. This station is ice-free providing accurate discharge data in the winter and spring when the stage-discharge relations for other stations are affected by ice. The data are used in the Streamflow Synthesis and Reservoir Regulation (SSARR) forecasting model for the lower Saint John River.

Platforms 6512 and 6517 are on the Root and South Nahanni River, tributaries to the Mackenzie River. The data from these stations along with data transmitted by DCPs from the Mackenzie River itself are used in preparing daily water level forecasts of the Mackenzie River during the short navigation season.

Many of the Ball DCPs have been tested and readied for installation at a site on the Bow River below Carseland Dam near Calgary, Alberta. (Fig. 1)

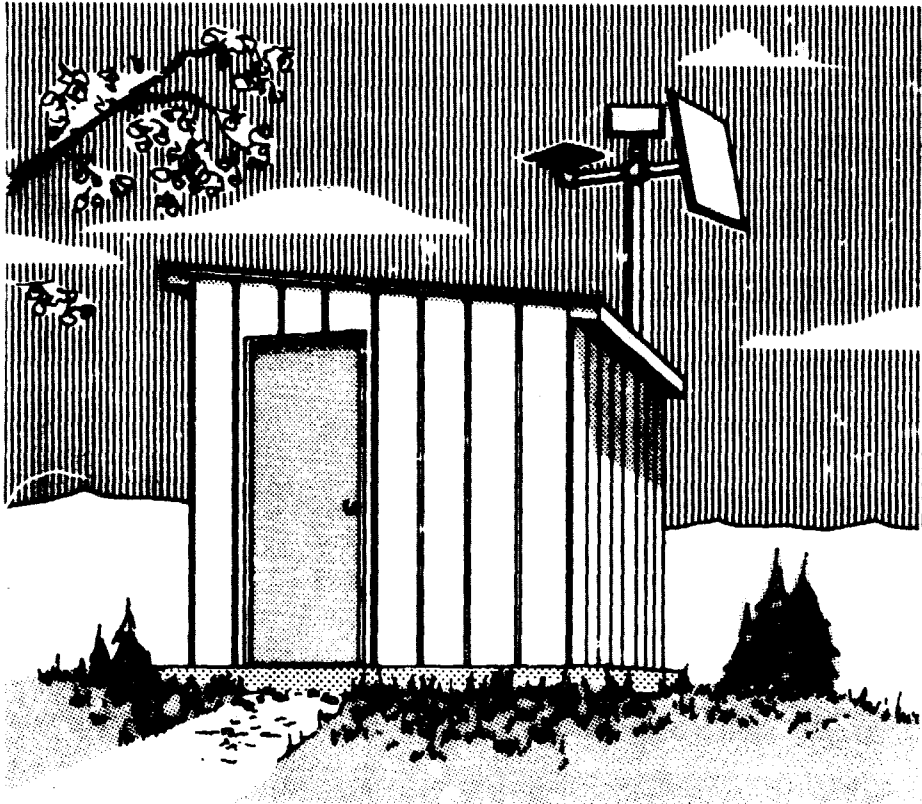


Figure 1 - Bow River Test Site

The antenna on the left is for Landsat; on the right GOES. In the center is a 3.5 W Solarex Corporation Model 435 Solar panel that is being tested as a battery charger. The unit has a cut-off voltage of 14.7 V and is installed 3.m above ground level facing due south at an elevation angle of 45 degrees. The maximum daily output has been in the order of 4500 C with 1500 C being produced in intermittent overcast conditions.

A BBRC add-on memory module has been connected to DCP 6210 which belongs to another Principal Investigator. Every 15 minutes a water level reading is entered into a shift register consisting of twelve, 60 bit memory sets. The memory sets are transmitted sequentially every 90 seconds. The number of messages received is sufficient to reconstruct the water level hydrograph on the basis of one reading every 15 minutes.

A new data format has been implemented since receiving the BBRC platforms. To meet the requirements of NESS for the SMS-GOES system an American Standard Code for Information Interchange (ASCII) compatible format will be used for all parallel digital words. This will save changing interface cables in the field if platforms are converted from Landsat to GOES operation. The format requires that the most significant digit be on the left, but that within each digit, the most significant bit be on the right. All the BBRC and GE platforms except 6102 and 6232 will transmit in the new format. DCPs 6102 and 6232 are used in the serial digital mode as they are transmitting water level and meteorological data stored in an interface unit supplied by the Atmospheric Environment Service, Department of the Environment.

An example of the computer printout prepared from the data collection system card output is shown as Figure 2. Water level data are in the ASCII compatible format.

SUMMARY OF RETRANSMITTED DATA VIA LANDSAT-2 SATELLITE

STATION NO. 07MC003
PLATFORM NO. 6150

LAKE ATHABASCA NEAR CRACKINGSTONE POINT

PAGE 5

WATER RESOURCES BRANCH

DATE OCT. 23, 1975

OTTAWA, ONT.

DATE	TIME(CST)	STAGE	03 VOLTS	04 VOLTS	05	06	07 VOLTS	08 VOLTS
SEP 28.75	21 49 17	86.18	0.000	0.000	00	0.000	3.222	3.222
SEP 28.75	23 27 56	86.18	0.000	0.000	00	0.000	3.222	3.222
SEP 28.75	23 30 56	86.18	0.000	0.000	00	0.000	3.222	3.222
SEP 29.75	00 25 40	86.26	0.000	0.000	00	0.000	3.222	3.222
SEP 29.75	10 07 30	86.24	0.000	0.000	00	0.000	3.222	3.222
SEP 29.75	10 10 30	86.24	0.000	0.000	00	0.000	3.222	3.222
SEP 29.75	10 13 29	86.24	0.000	0.000	00	0.000	3.222	3.222
SEP 29.75	10 16 29	86.24	0.000	0.000	00	0.000	3.222	3.222
SEP 29.75	11 52 09	86.30	0.000	0.000	00	0.000	3.222	3.222
SEP 29.75	11 55 00	86.30	0.000	0.000	00	0.000	3.222	3.222
SEP 29.75	11 50 00	86.30	0.000	0.000	00	0.000	3.222	3.222
SEP 29.75	10 30 05	86.26	0.000	0.000	00	0.000	3.222	3.222
SEP 29.75	20 10 23	86.28	0.000	0.000	00	0.000	3.222	3.222
SEP 29.75	20 13 20	86.28	0.000	0.000	00	0.000	3.222	3.222
SEP 29.75	21 53 40	86.24	0.000	0.000	00	0.000	3.222	3.222
SEP 29.75	23 34 09	86.28	0.000	0.000	00	0.000	3.222	3.222
SEP 29.75	23 37 07	86.28	0.000	0.000	00	0.000	3.222	3.222
SEP 30.75	00 33 30	86.26	0.000	0.000	00	0.000	3.222	3.222
SEP 30.75	10 15 53	86.24	0.000	0.000	00	0.000	3.222	3.222
SEP 30.75	10 10 54	86.24	0.000	0.000	00	0.000	3.222	3.222
SEP 30.75	10 21 55	86.24	0.000	0.000	00	0.000	3.222	3.222
SEP 30.75	11 50 31	86.26	0.000	0.000	00	0.000	3.222	3.222
SEP 30.75	12 01 33	86.26	0.000	0.000	00	0.000	3.222	3.222
SEP 30.75	12 04 34	86.26	0.000	0.000	00	0.000	3.222	3.222
SEP 30.75	10 36 59	86.18	0.000	0.000	00	0.000	3.222	3.222
SEP 30.75	20 16 01	86.18	0.000	0.000	00	0.000	3.222	3.222
SEP 30.75	20 19 02	86.18	0.000	0.000	00	0.000	3.222	3.222
SEP 30.75	21 55 00	86.18	0.000	0.000	00	0.000	3.222	3.222
SEP 30.75	21 50 00	86.18	0.000	0.000	00	0.000	3.222	3.222
SEP 30.75	22 01 00	86.18	0.000	0.000	00	0.000	3.222	3.222
SEP 30.75	23 37 12	86.22	0.000	0.000	00	0.000	3.222	3.222
SEP 30.75	23 40 12	86.22	0.000	0.000	00	0.000	3.222	3.222
SEP 30.75	23 43 12	86.22	0.000	0.000	00	0.000	3.222	3.222

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Figure 2 - Printout of Data From DCS Output Cards

2. Major Problems

The supply of mating connectors for the BBRC platforms has been a problem. Initially, the mating connectors listed in the BBRC manual were incorrect. This took some time to sort out. Then the delivery of the connectors from United States manufacturers was slow as these connectors were not a shelf item. The problem could have been avoided if supply of mating connectors was called for in the CDCP-100 specifications.

3. Significant Results

The project continues to demonstrate the feasibility of transmitting hydrometric data to polar orbiting spacecraft and using these data for quasi-operational purposes.

4. Significant Changes in Operating Procedures

The adoption of the ASCII compatible format mentioned above.

5. Published Articles or Papers

A news release entitled "Satellite Data System Expanded" authored by Stephen Rybak, Inland Waters Information, Dept. of the Environment was released to the Canadian wire service on August 7, 1975. A copy appears at the end of this report.

A paper entitled "Data Retransmission by Satellite for Operational Purposes" by R.A. Halliday was prepared for presentation at the International Seminar on Modern Developments in Hydrometry, Padua, Italy during September 8-13, 1975.

A paper entitled "Some Operational Uses of Satellite Retransmission in Canada" by R.A. Halliday and I.A. Reid was prepared for presentation at Tenth International Symposium on Remote Sensing of Environment at Ann Arbor, Michigan, U.S.A. during October 6-10, 1975.

6. Recommendations

It is still true that, on the basis of the results to date, it is apparent that retransmission by satellite is an excellent method of obtaining data from isolated areas. In vast regions of Canada, it is the only way to obtain data on a near real time basis. It is therefore recommended that data required from remote areas be retransmitted by satellite.

7. Future Plans

To install the remaining BBRC Platforms and to determine cause of the malfunction of the BBRC DCP in the GOES mode.

To carry out corrective measures and test one or two additional BBRC DCPs in the GOES mode.



SATELLITE DATA SYSTEM EXPANDED

Environment Canada is expanding its use of satellites to gather vital information on water levels and flows from remote survey stations.

The Inland Waters Directorate will add 21 automatic data collection platforms this summer to the 9 in service to beam information to two U.S. resources satellites for retransmission to ground stations in the United States and on to Canada.

Data retransmitted by the Land Satellite (LANDSAT) and Geostationary Operational Environmental Satellite (GOES) can be put to use in Canada within an hour of being recorded at the remote monitoring sites. Normally such information would be stored at the inaccessible survey stations until a special trip was made to retrieve the data.

In a three-year experiment using the LANDSAT satellite, information from nine Data Collection Platforms (DCPs) was put to use immediately in preparing flood forecasts on the Fraser River; regulating power production on the Columbia; forecasting water levels for barge transportation on the Mackenzie; preparing a monthly run-off forecast; and planning hydrometric survey operations in Northern Ontario.

The first nine platforms were experimental. They were installed three years ago at Water Survey of Canada stations that were difficult and costly to reach. The sites provided a wide range of climatic conditions, which included temperatures as low as -50°C , winds up to 110/km/hr, and snow depths of two metres or more. Only one platform failed - because it was struck by lightning.

Platforms recorded flows, water levels, precipitation, air temperature, water velocity, and spring ice break-up. Each platform reported as many as 20 times a day to the orbiting LANDSAT satellite, which relayed data to the LANDSAT receiving station in Maryland. Data were partially processed and then forwarded to the

This information was released to the wire services on the date indicated. Despite the delay, some releases and speeches are mailed to out-of-town media because the content is not time-dependent or because it will be useful for background files.

Cette information a été transmise aux agences de presse à la date indiquée. Malgré le retard, certains communiqués et discours sont expédiés aux médias de l'extérieur parce que leur contenu n'a rien à voir avec les délais ou parce qu'ils peuvent servir comme documentation.

Canada Centre for Remote Sensing in Ottawa over a telephone line. The whole process took from 30 to 40 minutes.

The LANDSAT satellite experiment proved that retransmission of data on a "real-time" basis was reliable, accurate and relatively inexpensive.

More than 200 Water Survey of Canada gauging stations in remote areas are now being considered as possible platform sites, and the Prairie Provinces Water Board is considering additional sites.

EDITOR'S NOTE: A visit to the Ottawa-area DCP site for photographs and an interview with the IWD project coordinator, Bob Halliday, can be arranged upon request.

84/7/29/75
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Inland Waters Information
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